RANGE IMPROVEMENT

NOTES

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INDEX

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STATEMENT OF PUPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developlemts and findings. These "NOTES" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these RANGE IMPROVEMENT NOTES are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

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COMANDRA IS NOT AN INVADER ON MOST WESTERN RANGES

By
William A. Laycock and R. G. Krebill[1/]

The effect of livestock grazing on abundance of comandra (*Comandra umbellata* ssp. *pallida*) is poorly understood. Comandra is a perennial rhizomatous forb that is parasitic on the roots of associated plants (Piehl, 1965). It is commonly found on dry open sites and rocky outcrops in sagebrush range. However, it also occurs in fairly dense stands of sagebrush or grass on deeper soils and occasionally in the understory of open stands of ponderosa pine and other trees. Because comandra is not very important in terms of total forage, it has received little attention in range management literature. Until 1961, comandra was listed as an "invader" in Region 4's Range Analysis Handbook. In the 1964 Handbook, comandra was still listed in the "least desirable" category.

Even though it is a minor forage plant, comandra is important in the Rocky Mountains as a host for comandra blister rust of lodgepole and ponderosa pine. Pines are infected by spores originating on comandra in nearby rangelands. Because comandra was believed to be low in palatability and thus liable to increase on overgrazed ranges, pathologists have suggested that outbreaks of comandra blister rust in lodgepole pine might have been triggered by increases in comandra caused by overgrazing. Our summary of available published and unpublished information of the use of comandra by livestock and big game challenges this idea by clarifying the relationship between grazing, abundance of comandra, and outbreaks of comandra blister rust.

Palatability and Effects of Use by Livestock and Big Game

SHEEP

Comandra is quite palatable to sheep. It was found to be part of sheep's diet on summer range areas in northern Utah by Cook et al., (1961) and in the Gravelly Mountains in southwestern Montana by Peek (1963).

In northern California, Meinecke (1928) reported that destructive grazing by sheep was at least partly responsible for a considerable reduction in the comandra population in the Mount Lassen area. On the sagebrush-grass ranges at the U.S. Sheep Experiment Station near Dubois, Idaho, sheep often eat 50 to 90 percent of the comandra on ranges grazed in spring. Because of this heavy use, comandra becomes quite scarce on overgrazed ranges, although it is commonly found on ranges in good condition (Mueggler, 1950). In one study

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at the Sheep Station, heavy spring grazing caused the range to deteriorate from good to poor condition and reduced production of comandra from 20 to 1 pound per acre. Production of comandra remained at about 20 pounds per acre on adjacent ranges kept in good condition by favorable fall grazing treatments or by complete protection from grazing (Laycock, 1967). In an exclosure in another area at the Sheep Station, protection from grazing since 1931 resulted in a steady increase in production of comandra while production remained quite low on adjacent ranges grazed in spring and fall by sheep.

CATTLE

Cattle rarely eat comandra. The only use of comandra reported in the literature was on sagebrush-grass ranges in the Missouri River Breaks in central Montana. In this area Mackie (1965) found small amounts of cattle use on areas grazed in spring, summer, and fall. Data from fescue grassland in Alberta indicate that comandra may increase slightly under heavy summer grazing by cattle[2/]. In other areas, trends of comandra on heavily grazed ranges are poorly documented. For example, Lewis et al., (1965) list the response of comandra to cattle grazing as "uncertain."

DEER AND ANTELOPE

Both deer and antelope eat comandra; however, the effect of this use on abundance of comandra apparently has never been studied. Mackie (1965) reported deer use of comandra in spring, summer, and fall in sagebrush-grass, ponderosa pine-juniper, and greasewood-sagebrush types in Montana. Deer enclosed in small sagebrush-grass paddocks in northern Utah in early summer used 13 to 25 percent of the comandra present[3/]. In May 1966, we observed heavy use (50 to 75 percent) of comandra on sagebrush-oakbrush-juniper range inside the Kanosh Livestock Exclosure in southern Utah. Cole (1956) and Cole and Wilkins (1958) in central Montana, and Dirschl (1963) in Saskatchewan found comandra in antelope rumens or observed use of comandra by antelope in spring and summer.

ELK

We found little information on the relative palatability of comandra to elk. In the Missouri River Breaks in central Montana, Mackie (1965) reported "relatively intensive" use of comandra by elk in late spring but only minor use by late summer and fall.

2/ Personal communication, Alexander Johnston, Canadian Dept. Agriculture Research Station, Lethbridge, Alberta.

3/ Personal communication, Arthur D. Smith, Range Science Department, Utah State University, Logan, Utah.

Use of comandra by elk in winter apparently has little effect on its abundance. On heavily grazed elk winter range in northwestern Wyoming, Jones (1964) found greater cover of comandra inside exclosures in five areas, greater cover of comandra in areas grazed by elk outside exclosures in two areas, and the same amount of comandra cover inside and outside exclosures in two areas. Average percentage ground cover of comandra in the nine areas was slightly higher in the exclosures (1.8%) than in the grazed areas (1.4%).

COMBINED USE BY MORE THAN ONE TYPE OF ANIMAL

Comandra often decreases on ranges grazed by two or more types of animals. This is especially true where sheep are grazed with other animals. In sagebrush-rabbitbrush-snowberry range outside the snowberry exclosure in Ephraim Canyon in central Utah, heavy grazing by sheep, cattle, and deer has kept comandra at a relatively low level since 1926; protection from all types of grazing has resulted in a very large increase in density of comandra:

	Comandra Shoots				
	1926	1938	1950	1958	1966
	(Thousands per acre)				
Inside Snowberry Exclosure	0	0	49	107	115
Grazed area outside exclosure	1	3	8	4	4

On thin-soil prairie areas in Wisconsin, Dix (1959) found that comandra was at some disadvantage on areas grazed by cattle, sheep, and horses.

The response of comandra on ranges grazed by elk and livestock is somewhat varied. In one exclosure established in 1956 along a cattle driveway and near an elk winter feeding area in the Gros Ventre drainage of northwestern Wyoming, number of comandra shoots remained about the same from 1956 to 1965 inside the exclosure, but increased on the grazed range outside the exclosure. However, in the same general area, Jones (1964) found more comandra inside exclosures than on adjacent range grazed by cattle and elk and by sheep and elk.

CONCLUSIONS

The evidence indicates that three common ideas concerning the relationship of grazing to comandra and comandra blister rust need revision:

Common Ideas Concerning Comandra	Concept Based on Evidence Presented
Comandra is unpalatable to all grazing animals.	Comandra is not very palatable to cattle but it is quite palatable to sheep, deer, and antelope and moderately patable to elk.
Comandra increases on or invades overgrazed ranges.	Comandra decreases in ranges grazed heavily by sheep either alone or in combination with other animals. No clearcut response pattern is apparent on cattle range.
Increases of comandra caused by overgrazing have been responsible for outbreaks of comandra blister rust in lodgepole pine.	Since overgrazing probably has not caused comandra to increase on most ranges, there seems to be no relationship between grazing and rust outbreaks.

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IMPROVEMENT OF ANCHOR CHAINS

John K. Chambers
Bureau of Land Management, Ely, Nevada

The Ely District of the Bureau of Land Management made two modifications on a 90-pound anchor chain.

The first modification was the welding of 3-inch malleable angle iron onto the 50 center feet of a 190-foot chain with 90-pound links. The angle iron was welded at right angles across the links and extended about four inches on either side of the link. Five hundred pounds of the angle iron were used in making the modification. It took about one man-week of steady work to cut and weld the teeth onto the chain. The chain was then tested on a project known as the Milk Ranch Chaining and Seeding on the west side of Lake Valley, Nevada. One D-7 and one D-9 caterpillar tractor was used to pull the 160 feet of chain. Several pulling patterns were used, but the most efficient was found to be in the form of a reversed "J." (See Drawing No. 1.) The chain was attached to the cat by the use of a type of swivel commonly used on cranes. The area was chained twice, once in each direction. Grass seed and bitterbrush seed were hand broadcast between the chainings. This work was accomplished during September 1966.

During the first part of the chaining trials, the chain was quite efficient where the angle iron teeth were welded. Except for the center 50 feet of the chain, there was no modification to either end of the chain. Approximately 50 percent of the sagebrush was removed during the first pass of the chain. During the second pass another 20 to 30 percent of the remaining sagebrush was removed. This applied only to the center portion where the angle iron teeth were located. About 30 percent of the sagebrush was removed where the chain was not modified by the addition of teeth during the first pass and about 15 percent more on the second pass. As the cats pulled forward, the chain rolled in the direction of tractor pull, causing a rooting action roll to the chain. The swivels proved to be one major problem in using the chain. A lot of time was involved shutting down the cat to lubricate the swivels. The swivels were not equipped with any device for use of a grease gun or self-lubricating bearings. About every half-hour to forty-five minutes the cats would be shut down and a lubricant, such as Lubriplate, was smeared onto the shank of the hook on the swivel. Also, about halfway through the 400-acre Milk Ranch Chaining trial, the angle iron teeth began to deteriorate rapidly. The 4-inch projections on either side of the chain links were badly twisted, torn, and mutilated so as to become nearly useless.

During the last 200 acres of the chaining, the efficiency of brush removal was drastically reduced. No more than 45 percent of the brush on the average was being removed by twice-over chaining with the portion of chain having teeth.

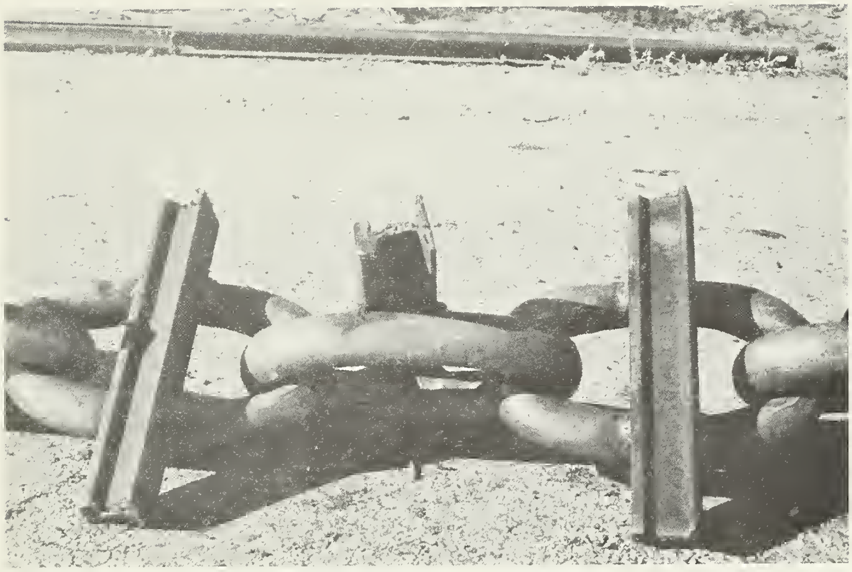
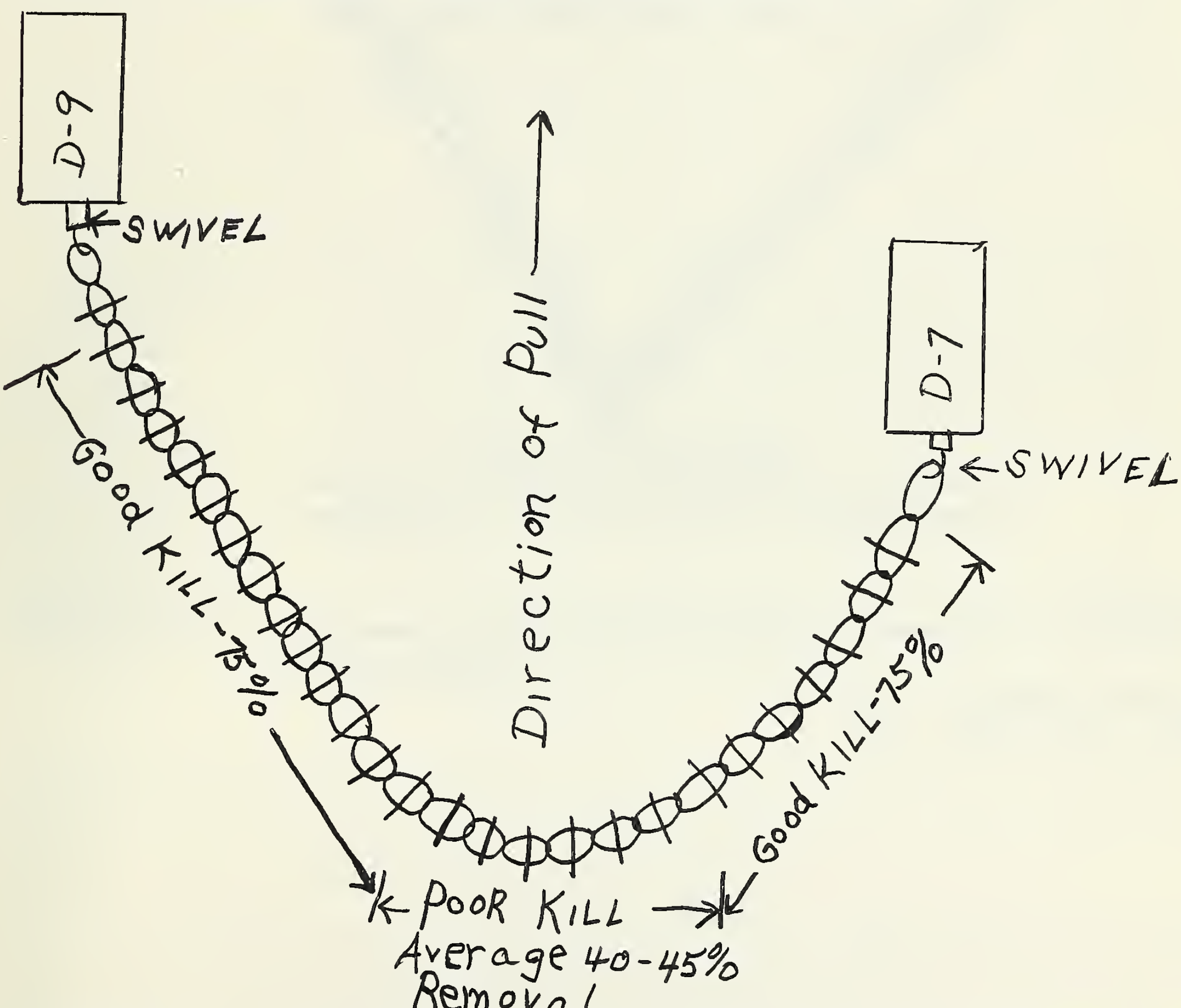


Fig. 1. Closeup of railroad steel teeth welded on links.

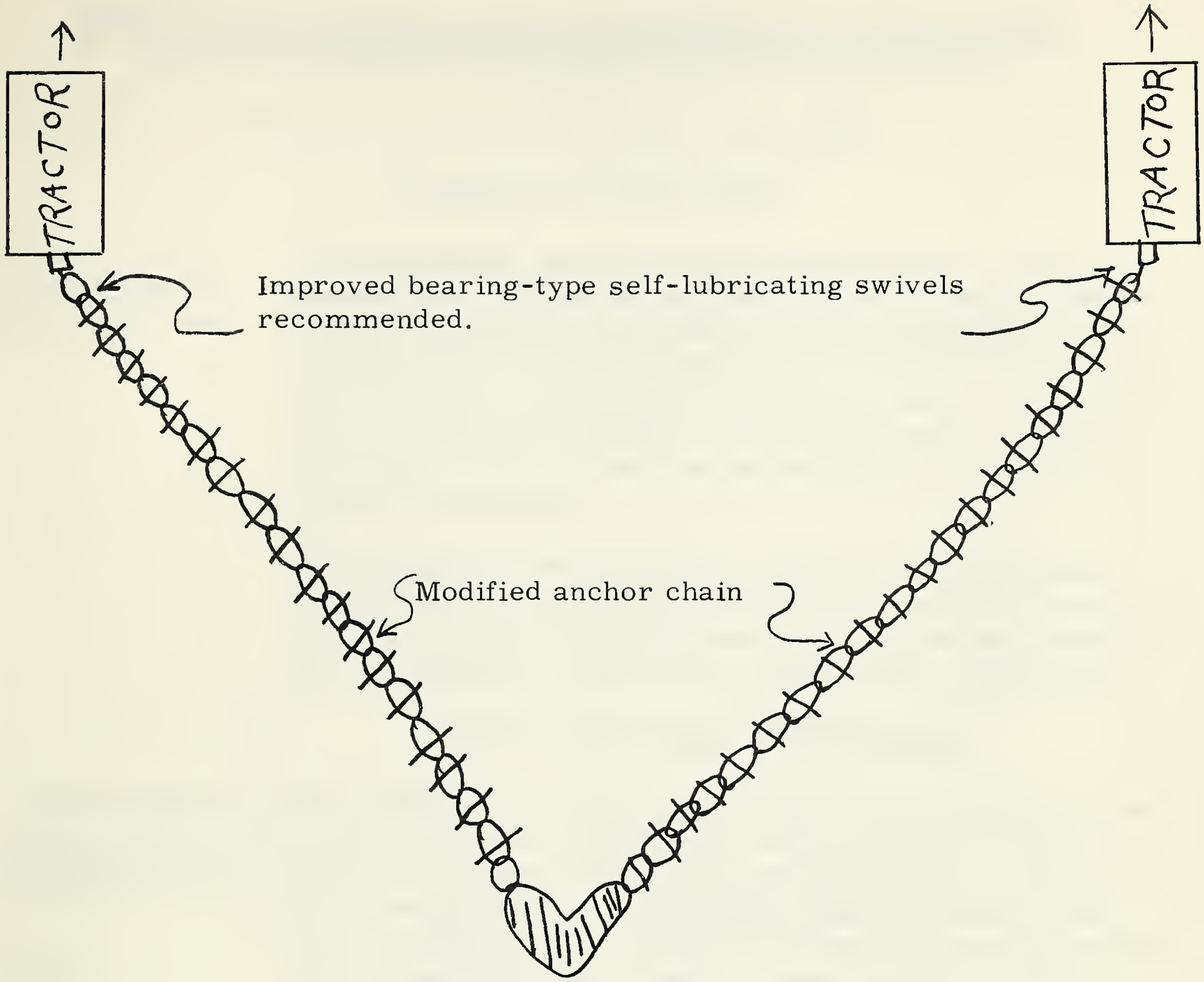
Fig. 2. Same as above - showing one end of chain.

The second modification to the chain came with the addition of welding 30-pound railroad steel teeth onto the remainder of the chain. The setup was essentially the same as for the angle iron, with the railroad steel extending about four inches on either side of the link (Fig. 1.). This material held up quite well under severe usage. The same pulling pattern was used on testing the chain on the 1000-acre Dutch John Chaining and Seeding. The chain as now modified, has about 40 feet on each end equipped with railroad iron teeth (Fig. 2.), and the center 50 feet is still equipped with the mutilated angle iron teeth.

The thousand acres were chained two ways. Again the pulling pattern was in the form of a "J" with the D-9 pulling the largest amount of chain. The angle iron teeth continued to be mutilated even more on this 1000-acre job. After two-way chaining, about 75 percent of the brush was removed on the straightest part of the chain. About 45 percent of the brush was removed in the loop of the "J" where the mutilated angle iron was located. Total cost for the two-way chaining in sagebrush was approximately $3.50 per acre.



Drawing No. 1 - Pulling pattern used on 160 feet of 90-pound Anchor Chain modified by the Ely District Office, Bureau of Land Management, Ely, Nevada.



Double Swivel Block
Weighing around 1,000 pounds to be developed.
Swivels to be bearing-type, self-lubricating.

Drawing No. 2 - Proposed pulling pattern if adequate swivels, as indicated, are developed.

By: JKC - November 1966
BLM - Ely District Office

EFFECTS OF GRAZING AND SOIL MOISTURE ON BULK DENSITY ON THE DIAMOND MOUNTAIN CATTLE ALLOTMENT [1/]

By
William A. Laycock and Paul W. Conrad[2/]

REASON FOR THE STUDY

Role of grazing in soil compaction needs study.

The question of soil compaction is important in range management. Rotation and rest-rotation grazing systems require grazing of heavy concentrations of livestock during all or part of the growing season, followed by complete rest during the remainder of the season or the following year. Some land managers believe that such concentrations may cause serious and permanent soil compaction through trampling.

We conducted a study in 1962 on the Diamond Mountain Cattle Allotment of the Ashley National Forest to determine the effect of grazing on the topsoil, using the bulk density (specific gravity) method of measuring soil compaction.

STUDY AREA AND PROCEDURES

Topsoil samples in grazed and ungrazed areas.

The study area was 25 miles north of Vernal, Utah, at an elevation of about 8,000 feet. Soil samples were taken inside and outside seven ungrazed exclosures. Three of these exclosures were in grassy swales; the other four were in upland areas. The exclosures had been protected from grazing for three years. Grazing outside most of the exclosures was quite heavy during the summer of 1962.

Bulk density samples taken before and after grazing.

Soil samples were taken at depths of 0-1, 1-2, 2-4, and 4-6 inches in June before grazing and again in September near the end of the grazing season. These were placed in soil cans, weighed, ovendried, and reweighed. Bulk density was expressed as grams of ovendry soil per cubic centimeter (field volume).

1/ For more details see "Effect of grazing on soil compaction as measured by bulk density on a high elevation cattle range" by W. A. Laycock and P. W. Conrad, Jour. Range Management, May 1967.

2/ Plant Ecologist and Assistant Range Scientist, respectively, at the U.S. Forest Service Intermountain Forest and Range Experiment Station's Forestry Laboratory, Logan, Utah.

Grazing did not cause soil compaction.

Bulk densities were similar in the grazed and ungrazed areas in both June and September (figure 1). This indicates that grazing in 1962 did not compact the soil as measured by bulk density.

However, bulk density increased significantly during the summer in all areas. Because the increases were as great in ungrazed as in grazed areas, it is obvious that grazing was not responsible.

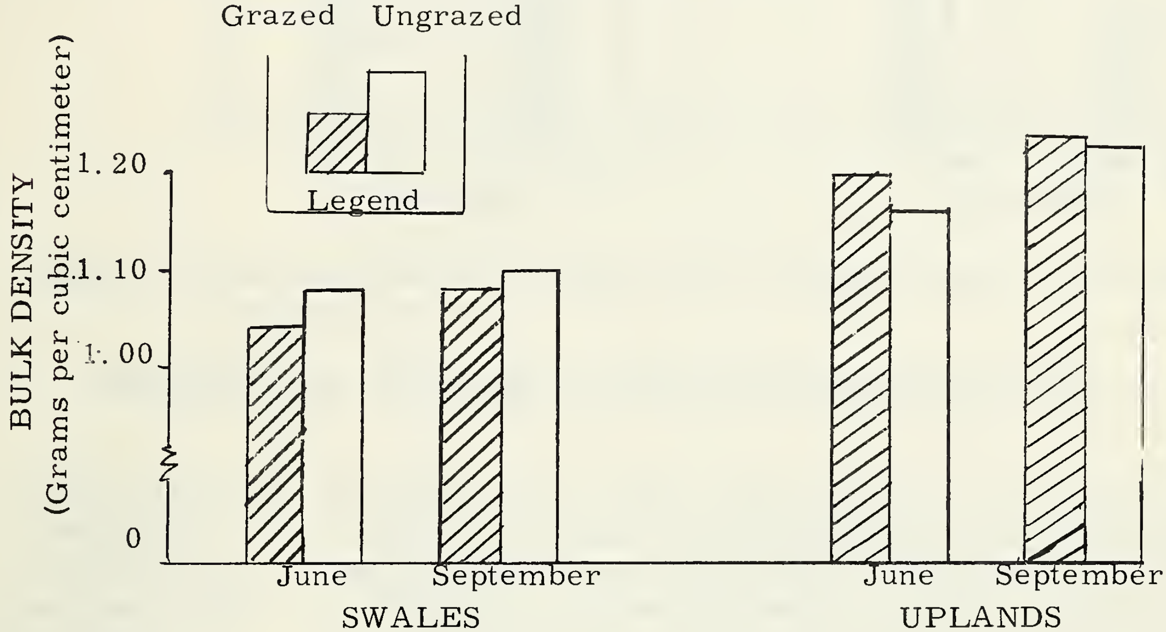


Figure 1. - Average bulk density of soil samples taken in early and late summer.

Increase in bulk density during summer was caused by decrease in soil moisture.

We found that the major factor responsible for this increase in bulk density was decrease in soil moisture. The samples taken in June were moist but not saturated (figure 2). The soils dried rapidly during the summer and were quite dry when sampled in September.

Soils with higher moisture content consistently had lower bulk densities than drier soils had. This relationship is the result of shrinking and swelling of the soil in response to changes in moisture. The moist samples taken in June were more swollen than the dry samples taken in September; consequently, their weight per unit volume was lower.

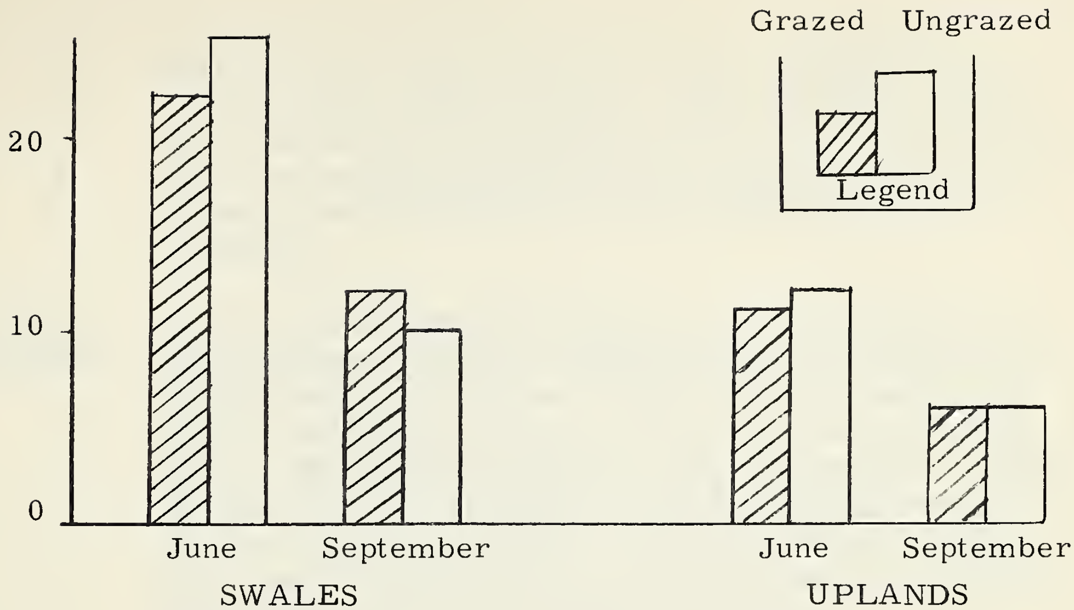


Figure 2 - Average moisture content of soil samples taken in early and late summer.

PROBLEMS ON INTERPRETATION OF BULK DENSITY DATA

Erroneous conclusions are reached when soil conditions are different.

Inasmuch as all soils shrink and swell in response to moisture conditions (in varying degrees depending on the amount of clay in the soil), the bulk density method of measuring soil cannot be used to compare the effects of grazing treatments unless soil moisture conditions are approximately the same. Differences in bulk density caused by differences in soil moisture could mistakenly be attributed to grazing unless comparable data are obtained on both grazed and ungrazed areas. If only the grazed areas had been sampled in our study, the erroneous conclusion could have been reached that grazing caused soil compaction when actually, grazing had no effect.

Trampling can affect infiltration and pore space.

Trampling by grazing livestock can influence soil characteristics other than bulk density, such as amount and distribution of pores and rate of infiltration of water. These characteristics may be better indicators of the effect of grazing on the soil than bulk density. However,

bulk density is one of the factors that affects the rate at which water enters the soil. For example, infiltration rate generally decreases as bulk density increases. Thus precautions mentioned above should also be observed when infiltration data from different areas are compared.

Further study being conducted.

Watershed Management Research personnel from the Intermountain Forest and Range Experiment Station are making additional studies of the relation between bulk density and soil moisture, pore space, and infiltration rate on the Diamond Mountain Cattle Allotment. These studies will determine how time of sampling as well as grazing treatments affect all of these characteristics. The results should provide a better basis for measurement of the effects of grazing on the soil.

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A man of few words seldom has to take too many back.

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Before backing . . . . if you're not <u>sure</u>, FIND OUT!

* * * * * * *

Enemies are the heritage of the successful - Nobody envies a failure.